VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

June 3, 2014

10 CFR 50.90

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Serial No.: 14-262
SPS/LIC-CGL: R1
Docket Nos.: 50-280/281
License Nos.: DPR-32/37

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
PROPOSED LICENSE AMENDMENT REQUEST
CLARIFICATION OF REACTOR COOLANT SYSTEM
HEATUP AND COOLDOWN LIMITATIONS TECHNICAL SPECIFICATION FIGURES

Pursuant to 10CFR50.90, Virginia Electric and Power Company (Dominion) is submitting a license amendment request to revise the Surry Power Station (Surry) Units 1 and 2 Technical Specifications (TS). Specifically, TS Figures 3.1-1 and 3.1-2, *Surry Units 1 and 2 Reactor Coolant System Heatup Limitations* and *Surry Units 1 and 2 Reactor Coolant System Cooldown Limitations*, respectively, are being revised for clarification and to be fully representative of the allowable operating conditions during Reactor Coolant System (RCS) startup and cooldown evolutions. The revisions to TS Figures 3.1-1 and 3.1-2 include: 1) the extension of the temperature axes to reflect temperatures up to RCS full power operation, 2) the extension of the pressure axes to less than 0 psig to bound RCS conditions when vacuum-assist fill of the RCS loops is performed, and 3) the addition of information regarding the reactor boltup temperature. Associated changes to the TS 3.1.B Basis are also provided.

Attachment 1 provides a discussion of the proposed change. The marked-up and typed proposed pages for the TS and TS Basis are provided in Attachments 2 and 3, respectively. The TS Basis changes are provided for NRC information only.

We have evaluated the proposed amendment and have determined that it does not involve a significant hazards consideration as defined in 10CFR50.92. The basis for this determination is included in Attachment 1. We have also determined that operation with the proposed change will not result in any significant increase in the amount of effluents that may be released offsite or any significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed amendment is eligible for categorical exclusion from an environmental assessment as set forth in 10CFR51.22(c)(9). Pursuant to 10CFR51.22(b), no environmental impact statement or environmental assessment is needed in connection with the approval of the proposed change. The proposed TS change has been reviewed and approved by the Facility Safety Review Committee.

A001
NRR

Dominion requests approval of the proposed change by May 29, 2015 with a 60-day implementation period.

Should you have any questions or require additional information, please contact Mr. Gary D. Miller at (804) 273-2771.

Respectfully,

Mark D. Sartain
Vice President – Nuclear Engineering

Commitments contained in this letter: None

Attachments:

1. Discussion of Change
2. Marked-up Technical Specifications and Bases Pages
3. Proposed Technical Specifications and Bases Pages

Vicki L. Hull
NOTARY PUBLIC
Commonwealth of Virginia
Reg. # 140542
My Commission Expires May 31, 2018

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mr. Mark D. Sartain, who is Vice President – Nuclear Engineering, of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 3rd day of June, 2014.

My Commission Expires: May 31, 2018.

Vicki L. Hull
Notary Public

cc: U.S. Nuclear Regulatory Commission - Region II
Marquis One Tower
245 Peachtree Center Avenue, NE Suite 1200
Atlanta, GA 30303-1257

State Health Commissioner
Virginia Department of Health
James Madison Building – 7th floor
109 Governor Street
Suite 730
Richmond, VA 23219

Dr. V. Sreenivas
NRC Project Manager – Surry and North Anna
U.S. Nuclear Regulatory Commission
One White Flint North
Mail Stop 08 G-9A
11555 Rockville Pike
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Surry Power Station

Attachment 1

DISCUSSION OF CHANGE

Virginia Electric and Power Company
(Dominion)
Surry Station Units 1 and 2

DISCUSSION OF CHANGE

1.0 INTRODUCTION

In accordance with the provisions of 10CFR50.90, Virginia Electric and Power Company (Dominion) is submitting a license amendment request (LAR) to revise the Surry Power Station (Surry) Units 1 and 2 Technical Specifications (TS). TS Figures 3.1-1 and 3.1-2, *Surry Units 1 and 2 Reactor Coolant System Heatup Limitations* and *Surry Units 1 and 2 Reactor Coolant System Cooldown Limitations*, respectively, are being revised for clarification and to be fully representative of the allowable operating conditions during Reactor Coolant System (RCS) startup and cooldown evolutions. Specifically, the revisions to TS Figures 3.1-1 and 3.1-2 are the extension of the temperature axes to reflect temperatures up to RCS full power operation, the extension of the pressure axes to less than 0 psig to bound RCS conditions to support vacuum-assist fill of the RCS loops, and the addition of information regarding the reactor boltup temperature. Associated TS 3.1.B Basis changes are included for information.

2.0 BACKGROUND

By letter dated February 19, 2014, the Pressurized Water Reactors Owners Group (PWROG) notified industry representatives of an operating experience (OE) issue regarding non-compliance with TS reactor pressure vessel (RPV) pressure/temperature (P/T) limits during vacuum refill of the RCS in Mode 5 (Reference 7.1). Specifically, the OE issue noted that some licensees may have TS heatup and cooldown P/T limits figures that have pressure axes that terminate at 0 psig, even though they may operate with a vacuum in the RCS (i.e., below 0 psig) during certain startup and cooldown evolutions (e.g., vacuum-assist refill). The PWROG recommended that plants with this issue should submit an LAR to revise the TS RCS heatup and cooldown P/T limits figures to extend the pressure scale to less than 0 psig.

Dominion reviewed the Surry TS requirements and plant operating practices regarding RCS startup and cooldown evolutions relative to the RCS P/T limits figures. It was determined that, while Surry is operating in compliance with the TS (i.e., within the acceptable region of the P/T curves), the x (abscissa) and y (ordinate) axes (RCS temperature and pressure scales, respectively) of TS Figures 3.1-1 and 3.1-2 do not currently reflect temperatures up to RCS full power operation or pressures less than 0 psig to bound RCS conditions to support vacuum-assist fill of the RCS loops.

During a March 10, 2014 conference call with the NRC to discuss this issue, it was concluded that Surry is operating in compliance with the TS, but it was also noted that clarification of the TS P/T limits figures is needed to be fully representative of the allowable operating conditions. Specifically, the NRC stated the following:

a. The TS figures should reflect operation at negative pressure to bound vacuum fill of the RCS loops,

b. The limiting reactor vessel head boltup temperature should be reflected on the TS figures, and

c. The LAR should be processed in a reasonable time frame.

Consequently, this LAR has been prepared to address the applicable industry OE and the NRC comments received during the March 10, 2014 conference call. The proposed revisions are summarized in the following section.

3.0 PROPOSED CHANGE

The proposed revisions to TS Figures 3.1-1 and 3.1-2, the *Surry Units 1 and 2 Reactor Coolant System Heatup Limitations* and the *Surry Units 1 and 2 Reactor Coolant System Cooldown Limitations*, respectively, and to the TS 3.1.B Basis are summarized as follows and are discussed in Section 4.1 - Technical Evaluation.

- TS Figures 3.1-1 and 3.1-2 are revised for clarification as follows:
  - The temperature axes are extended from 400°F to 650°F, which corresponds to the reactor vessel design temperature and bounds temperatures up to RCS full power operation.
  - The pressure axes are extended from 0 psig to -14.70 psig to bound RCS conditions to support vacuum-assist fill of the RCS loops, which is a loop fill option addressed in the Surry RCS fill operating procedures.
  - The phrase, "Limiting Boltup Temperature Surry Unit 1 Initial RT_{NDT} Closure Flange Region: 10°F," is added, since the figures do not currently address boltup temperature.

- The TS 3.1.B Basis is revised as follows:
  - A statement is added indicating that vacuum-assist fill of the RCS loops in Cold Shutdown or Refueling Shutdown is an acceptable condition since the resulting pressure/temperature combination is located in the Acceptable Operation region of Figures 3.1-1 and 3.1-2.
  - A discussion of the reactor boltup temperature is added. The discussion 1) identifies the limiting boltup temperature being added to Figures 3.1-1 and 3.1-2 as 10°F, 2) indicates that an administrative minimum boltup temperature greater than 10°F is imposed to ensure the RCS temperatures are sufficiently high to prevent damage to the reactor vessel closure head/vessel flange during the removal or installation of reactor vessel head bolts, and 3) states that the limiting boltup temperature and the administrative boltup

temperature limit are in effect only when the reactor vessel head bolts are under tension.

- Clarification is provided regarding the limiting value of the nil-ductility reference temperature, RT_{NDT}, applicable to Units 1 and 2. Figures 3.1-1 and 3.1-2, which are both applicable to Units 1 and 2, are based on the limiting RT_{NDT} value for the Unit 1 intermediate-to-lower shell circumferential weld.

These TS 3.1.B Basis changes are provided to the NRC for information.

Marked-up TS Figures 3.1-1 and 3.1-2 and TS 3.1.B Basis pages and typed proposed TS and TS Basis pages are provided in Attachments 2 and 3, respectively.

4.0 TECHNICAL AND REGULATORY EVALUATIONS

4.1 Technical Evaluation

TS Figures 3.1-1 and 3.1-2 provide the RCS P/T limits for various modes of reactor operation. The limit curves establish the Acceptable and Unacceptable Operation conditions for varying pressure and temperature combinations. The P/T limits curves on Figures 3.1-1 and 3.1-2 are not being modified. Each of the clarifying changes to Figures 3.1-1 and 3.1-2, as well as the associated TS 3.1.B Basis changes, was evaluated and is discussed in the following paragraphs.

Extension of the Temperature and Pressure Axes on Figures 3.1-1 and 3.1-2 – The region of Acceptable Operation for RCS heatup and cooldown is illustrated schematically in Figures 3.1-1 and 3.1-2, respectively.

The extension of the temperature axes from 400°F to 650°F on Figures 3.1-1 and 3.1-2 is appropriate since the region of Acceptable Operation includes a maximum temperature corresponding to the reactor vessel design temperature of 650°F, which bounds temperatures up to RCS full power operation (nominally 573°F).

With the extension of the pressure axes from 0 psig to -14.70 psig, the region of Acceptable Operation includes a pressure range from -14.70 psig up to the maximum pressure set by the existing limit curves. The extension of the pressure axes to -14.70 psig on Figures 3.1-1 and 3.1-2 is appropriate to bound RCS conditions to support vacuum-assist fill of the RCS loops. The extension of the pressure axes is also appropriate since vacuum-assist fill of the RCS loops, which is discussed in the Basis of TS 3.17, Loop Stop Valve Operation, is an RCS loop fill option addressed in the Surry RCS fill operating procedures. Vacuum-assist fill of the RCS loops in COLD SHUTDOWN or REFUELING SHUTDOWN is an acceptable condition since the resulting pressure and temperature combination is located in the Acceptable Operation region of Figures 3.1-1 and 3.1-2. An engineering evaluation was performed by Dominion that demonstrates the RCS loop piping and steam generator tubing will

maintain their structural integrity with considerable margin when subjected to vacuum conditions during vacuum-assist loop fill.

The Surry vacuum-assist loop fill practice controlled by the Surry RCS fill operating procedures does not expose the reactor vessel to vacuum conditions. However, Westinghouse performed a review of the regulatory requirements for the reactor vessel P/T limits and the NRC-approved P/T limits development methodology when considering vacuum fill of the RCS (References 7.2 and 7.3). The Westinghouse review concluded that operation with a vacuum is covered under the existing methodology authorized by the NRC and described in 10CFR50, Appendix G, the ASME Code, and WCAP-14040-A, Revision 4, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Curves" (Reference 7.4). The Westinghouse review further concluded that vacuum fill of the RCS in Mode 5 [corresponding to Surry Conditions of Operation of COLD SHUTDOWN and REFUELING SHUTDOWN] does not violate the 10CFR50, Appendix G pressure and temperature requirements for the reactor vessel. The structural integrity of the Surry reactor vessels under vacuum is based on information in WCAP-14177, "Surry Units 1 and 2 Heatup and Cooldown Limit Curves for Normal Operation" (Reference 7.5). An engineering evaluation performed by Dominion, which included consideration of the Westinghouse review, concludes that vacuum fill does not adversely impact the structural integrity of the reactor vessels.

Boltup Temperature – As noted in the proposed revision to Figures 3.1-1 and 3.1-2, the limiting boltup temperature is 10°F. The TS 3.1.B Basis is being revised to state that the reactor boltup temperature is defined in 10CFR50, Appendix G as, "The highest reference temperature of the material in the closure flange region that is highly stressed by the bolt preload." The reactor may be bolted up at a temperature greater than the initial RT_{NDT} of the material stressed by the boltup (e.g., the vessel flange). An administrative minimum boltup temperature of greater than 10°F is imposed in station procedures to ensure the RCS temperatures are sufficiently high to prevent damage to the closure head/vessel flange during the removal or installation of reactor vessel head bolts. The limiting boltup temperature and the administrative boltup temperature limit are in effect only when the reactor vessel head bolts are under tension.

Clarification of the Limiting Value of the Nil-ductility Reference Temperature, RT_{NDT} – As noted in the TS 3.1.B Basis, RCS heatup and cooldown limit curves were calculated using the most limiting value of the nil-ductility reference temperature, RT_{NDT}, at the end of 48 effective full power years (EFPY) for Units 1 and 2. The TS 3.1.B Basis is being revised to reflect the following information. The RCS heatup and cooldown limit curves were previously calculated using the most limiting value of RT_{NDT} (228.4°F), which occurred at the 1/4-T, 0° azimuthal location in the Unit 1 intermediate-to-lower shell circumferential weld. Subsequently, the reactor vessel material property basis was amended based upon new data which showed that the most limiting value of RT_{NDT} (222.5°F) at 48 EFPY occurs at the 1/4-T, 0° azimuthal location in the Unit 2

intermediate-to-lower shell circumferential weld. The revised limiting material property (i.e., Unit 2 RT_{NDT} of 222.5°F) justified continued use of the existing heatup and cooldown limit curves (based on the Unit 1 RT_{NDT} of 228.4°F) to 48 EFPY for Units 1 and 2.

4.2 Regulatory Evaluation

By letter dated June 8, 1995, Virginia Electric and Power Company requested NRC approval of revised RCS heatup and cooldown P/T limits that were valid to the Surry Units 1 and 2 end-of-license dates (Reference 7.6). The NRC approved the revised P/T limits curves in TS Amendments 207/207, dated December 28, 1995 (Reference 7.7). By letter dated May 6, 2010, Dominion proposed a TS change to revise the Surry Units 1 and 2 TS RCS Heatup and Cooldown Limitations Figures 3.1-1 and 3.1-2 to reflect an increase in the cumulative core burnup applicability limit to 48 EFPY (Reference 7.8). The NRC approved the revised cumulative burnup applicability limit in TS Amendments 274/274, dated May 31, 2011 (Reference 7.9). The P/T limit curves on the figures were not changed by these amendments.

4.2.1 Applicable Regulatory Requirements

TS Figures 3.1-1 and 3.1-2 are being revised for clarification and to be fully representative of the allowable operating conditions during RCS startup and cooldown evolutions. With the implementation of the proposed changes, the Surry Units 1 and 2 TS will continue to assure that the necessary quality of this system and its components is maintained and the limiting conditions of operation of this system will continue to be met. Therefore, the requirements of 10CFR50.36 continue to be met with the changes proposed in this LAR.

4.2.2 No Significant Hazards Consideration

Virginia Electric and Power Company (Dominion) proposes a change to the Surry Power Station Units 1 and 2 Technical Specifications (TS). Specifically, TS Figures 3.1-1 and 3.1-2, *Surry Units 1 and 2 Reactor Coolant System Heatup Limitations* and *Surry Units 1 and 2 Reactor Coolant System Cooldown Limitations*, respectively, are being revised for clarification and to be fully representative of the allowable operating conditions during Reactor Coolant System (RCS) startup and cooldown evolutions. The pressure/temperature (P/T) limits curves on TS Figures 3.1-1 and 3.1-2 are not being modified. TS Figures 3.1-1 and 3.1-2 are revised for clarification as follows:

- The temperature axes are extended from 400°F to 650°F, which corresponds to the reactor vessel design temperature and bounds temperatures up to RCS full power operation (nominally 573°F).

- The pressure axes are extended from 0 psig to -14.70 psig to bound RCS conditions to support vacuum-assist fill of the RCS loops, which is a loop fill option addressed in the Surry RCS fill operating procedures and in the Basis of TS 3.17, Loop Stop Valve Operation.
- The phrase, "Limiting Boltup Temperature Surry Unit 1 Initial RT_{NDT} Closure Flange Region: 10°F," is added, since the figures do not currently address boltup temperature.

The NRC has provided standards for determining whether a significant hazards consideration exists as stated in 10CFR50.92(c) for a proposed amendment to an operating license for a facility. A determination that a proposed license amendment involves no significant hazards consideration may be made if operation of the facility in accordance with a proposed amendment would not: 1) involve a significant increase in the probability or consequences of an accident previously evaluated, or 2) create the possibility of a new or different kind of accident from any accident previously evaluated, or 3) involve a significant reduction in a margin of safety. Dominion has evaluated if a significant hazards consideration (SHC) is involved with the proposed change. A discussion of these standards as they relate to this change request is provided below.

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed clarification of TS Figures 3.1-1 and 3.1-2 does not involve a physical change to the plant and does not change the manner in which plant systems or components are operated or controlled. The proposed change does not alter or prevent the ability of structures, system, and components (SSCs) to perform their intended function to mitigate the consequences of an initiating event within the assumed acceptance limits. The P/T limits curves on TS Figures 3.1-1 and 3.1-2 are not being modified and remain valid.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The proposed clarification of TS Figures 3.1-1 and 3.1-2 does not involve any physical alteration of plant equipment; consequently, no new or different types of equipment will be installed. The proposed change does not adversely affect accident initiators or precursors nor alter the design assumptions, conditions, or configuration of the facility. The P/T limits curves on TS Figures 3.1-1 and 3.1-2 are

not being modified, and the basic operation of installed plant systems and components is unchanged.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The existing RCS P/T limits curves on TS Figures 3.1-1 and 3.1-2 are not being modified. The proposed clarification of TS Figures 3.1-1 and 3.1-2 does not alter any plant equipment, does not change the manner in which the plant is operated or controlled, and has no impact on any safety analysis assumptions. The proposed change does not alter the manner in which safety limits, limiting safety system settings, or limiting conditions for operation are determined. The proposed change does not result in plant operation in a configuration outside the analyses or design basis and does not adversely affect systems that respond to safely shut down the plant and to maintain the plant in a safe shutdown condition.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, Dominion concludes that the proposed change does not represent a significant hazards consideration under the standards set forth in 10CFR50.92(c).

4.2.3 Precedents

On March 5, 2014, the NRC issued an amendment to Indian Point Nuclear Generating Unit No. 2 to revise P/T limit curves, which included a note to allow operation of the RCS in a vacuum condition (Reference: ADAMS Accession No. ML14045A248). Also, by letter dated April 9, 2014, Indiana Michigan Power Company submitted an LAR to revise the Donald C. Cook Nuclear Plant TS RCS P/T limits to address their applicability during vacuum fill operations of the RCS (Reference: Letter AEP-NRC-2014-24 dated April 9, 2014). Surry Units 1 and 2 have similar RCS P/T limits requirements as they are Westinghouse-designed pressurized water reactors. Additionally, the methodology used to develop the Surry, Cook, and Indian Point P/T limits curves is based on the NRC approved WCAP-14040-NP-A (Reference 7.4).

5.0 ENVIRONMENTAL CONSIDERATION

This license amendment request meets the eligibility criteria for categorical exclusion set forth in 10CFR51.22(c)(9) as follows:

(i) The amendment involves no significant hazards consideration.

As described above, the proposed license amendment request clarifying TS Figures 3.1-1 and 3.1-2 does not involve a significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

The proposed license amendment request clarifies Figures 3.1-1 and 3.1-2 and does not affect the types or amounts of effluents that may be released offsite. Therefore, there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed license amendment request clarifies Figures 3.1-1 and 3.1-2 and does not affect individual or cumulative occupational radiation exposure. Therefore, there is no significant increase in individual or cumulative occupational radiation exposure.

Based on the above assessment, Dominion concludes that the proposed change meets the criteria specified in 10CFR51.22 for a categorical exclusion from the requirements of 10CFR51.22 relative to requiring a specific environmental assessment or impact statement by the Commission.

6.0 CONCLUSION

The proposed license amendment request revises TS Figures 3.1-1 and 3.1-2, *Surry Units 1 and 2 Reactor Coolant System Heatup Limitations* and *Surry Units 1 and 2 Reactor Coolant System Cooldown Limitations*, respectively, for clarification and to be fully representative of the allowable operating conditions. The proposed clarification expands the pressure and temperature axes of the graphs for completeness and adds a note reflecting the limiting boltup temperature. The TS 3.1.B Basis revisions add discussions of vacuum-assist fill of the RCS loops and reactor boltup temperature; in addition, the Basis is revised to provide clarification of the limiting value of the RT_{NDT}. The P/T limits curves on Figures 3.1-1 and 3.1-2 are not being modified. The proposed clarification of Figures 3.1-1 and 3.1-2 does not add or alter any plant equipment and does not change the manner in which the plant is operated or controlled. The structural integrity of the Surry reactor vessels, the RCS loop piping, and the steam generator tubing is not adversely affected by vacuum-assist fill of the RCS loops.

7.0 REFERENCES

7.1 PWR Owners Group letter OG-14-66, dated February 19, 2014 – Subject: "Non Compliance with the Pressure-Temperature Limits Technical Specification During Vacuum Refill of the RCS in Mode 5", (PA-SC-1115)

7.2 PWR Owners Group letter OG-14-84, dated March 3, 2014 – Subject: "Applicability of the Pressure-Temperature Limit Curve Figures During Vacuum Refill of the RCS in Mode 5", (PA-SC-1115)

7.3 Westinghouse letter MCOE-LTR-14-17, Rev. 0, dated March 3, 2014 – Subject: "Applicability of the Pressure-Temperature Limit Curve Figures During Vacuum Refill of the RCS in Mode 5 for Westinghouse and CE NSSS Plants" (Westinghouse Proprietary Class 2) [included in PWR Owners Group Letter OG-14-84 as Enclosure 1]

7.4 WCAP-14040-NP-A, Revision 4, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves," (May 2004)

7.5 WCAP-14177, "Surry Units 1 and 2 Heatup and Cooldown Limit Curves for Normal Operation," (October 1994)

7.6 Letter Serial No. 95-197 from Virginia Electric and Power Company to the USNRC dated June 8, 1995, Virginia Electric and Power Company, "Surry Power Station Units 1 and 2, Request for Exemption - ASME Code Case N-514, Proposed Technical Specifications Change, Revised Pressure/Temperature Limits and LTOPS Setpoint"

7.7 Letter from the USNRC to Virginia Electric and Power Company dated December 28, 1995, "Subject: Surry Units 1 and 2 - Issuance of Amendments Re: Surry Units 1 and 2 Reactor Vessel Heatup and Cooldown Curves, (TAC NOS. M92537 and M92538)"

7.8 Letter Serial No. 10-199 from Virginia Electric and Power Company to the USNRC dated May 6, 2010, "Virginia Electric and Power Company (Dominion), Surry Power Station Units 1 and 2, License Amendment Request, Revised Cumulative Core Burnup Applicability Limit for Heatup and Cooldown Curves, Low Temperature Overpressure Protection System (LTOPS) Setpoint, and LTOPS Enable Temperature"

7.9 Letter from the USNRC to Virginia Electric and Power Company dated May 31, 2011, "Subject: Surry Power Station, Unit Nos. 1 and 2 – Issuance of Amendments regarding Reactor Vessel Heatup and Cooldown Curves for 48 Effective Full Power Years (TAC Nos. ME3920 and ME3921)"

Attachment 2

MARKED-UP TECHNICAL SPECIFICATIONS AND BASES PAGES

Virginia Electric and Power Company
(Dominion)
Surry Station Units 1 and 2

3. The pressurizer heatup and cooldown rates shall not exceed 100°F/hr. and 200°F/hr., respectively. The spray shall not be used if the temperature difference between the pressurizer and the spray fluid is greater than 320°F.

Basis

The temperature and pressure changes during heatup and cooldown are limited to be consistent with the requirements given in the ASME Boiler and Pressure Vessel Code, Section III, Appendix G.

1) The reactor coolant temperature and pressure and system heatup and cooldown rates (with the exception of the pressurizer) shall be limited in accordance with Figures 3.1-1 and 3.1-2.

   a) Allowable combinations of pressure and temperature for specific temperature change rates are below and to the right of the limit lines shown. Limit lines for cooldown rates between those presented may be obtained by interpolation.

   b) Figures 3.1-1 and 3.1-2 define limits to assure prevention of non-ductile failure only. For normal operation, other inherent plant characteristics, e.g., pump heat addition and pressurizer heater capacity, may limit the heatup and cooldown rates that can be achieved over certain pressure-temperature ranges.

INSERT A

2) These limit lines shall be calculated periodically using methods provided below.

3) The secondary side of the steam generator must not be pressurized above 200 psig if the temperature of the steam generator is below 70°F.

INSERT B

Heatup and cooldown limit curves are calculated using the most limiting value of the nil-ductility reference temperature, RT_{NDT}, at the end of 48 Effective Full Power Years (EFPY) for Units 1 and 2. ~~The most limiting value of RT_{NDT} (222.5°F) occurs at the 1/4 T, 0° azimuthal location in the Unit 2 intermediate to lower shell circumferential weld.~~ The limiting RT_{NDT} at the 1/4-T location in the core region is greater than the RT_{NDT} of the limiting unirradiated material. This ensures that all components in the Reactor Coolant System will be operated conservatively in accordance with applicable Code requirements.

The reactor vessel materials have been tested to determine their initial RT_{NDT}; the results are presented in UFSAR Section 4.1. Reactor operation and resultant fast neutron (E greater than 1 MEV) irradiation can cause an increase in the RT_{NDT}. Therefore, an adjusted reference temperature, based upon the copper and nickel content of the material and the fluence was calculated in accordance with the recommendations of Regulatory Guide 1.99, Revision 2 "Effects of Residual Elements on Predicted Radiation Damage to Reactor Vessel Materials." The heatup and cooldown limit curves of Figures 3.1-1 and 3.1-2 include predicted adjustments for this shift in RT_{NDT} at the end of 48 EFPY for Units 1 and 2 (as well as adjustments for location of the pressure sensing instrument).

Surveillance capsules will be removed in accordance with the requirements of ASTM E185-82 and 10 CFR 50, Appendix H. The surveillance specimen withdrawal schedule is shown in the UFSAR. The heatup and cooldown curves must be recalculated when the ΔRT_{NDT} determined from the surveillance capsule exceeds the calculated ΔRT_{NDT} for the equivalent capsule radiation exposure, or when the service period exceeds 48 EFPY for Units 1 and 2 prior to a scheduled refueling outage.

INSERT C

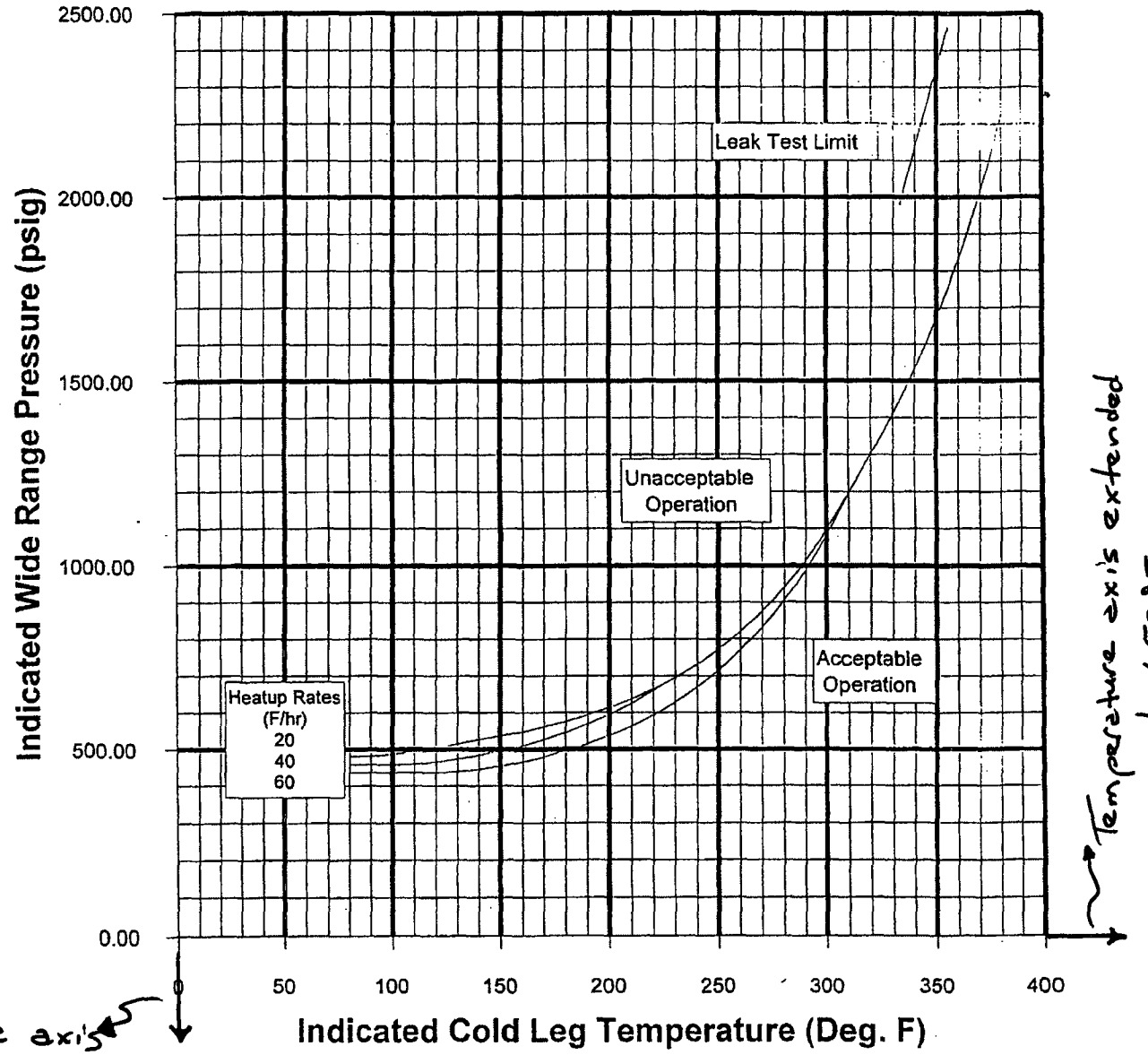
References

(1) UFSAR, Section 4.1, Design Bases

Surry Units 1 and 2
Reactor Coolant System Heatup Limitations

INSERT D

Material Property Basis
Limiting Material: Surry Unit 1 Intermediate to Lower Shell Circ Weld
Limiting ART Values for Surry 1 at 48 EFPY: 1/4-T, 228.4F
3/4-T, 189.5 F



Pressure axis extended to -14.70 psig

Figure 3.1-1 : Surry Units 1 and 2 Reactor Coolant System Heatup Limitations (Heatup Rates up to 60°F/hr) Applicable for 48 EFPY

Surry Units 1 and 2
Reactor Coolant System Cooldown Limitations

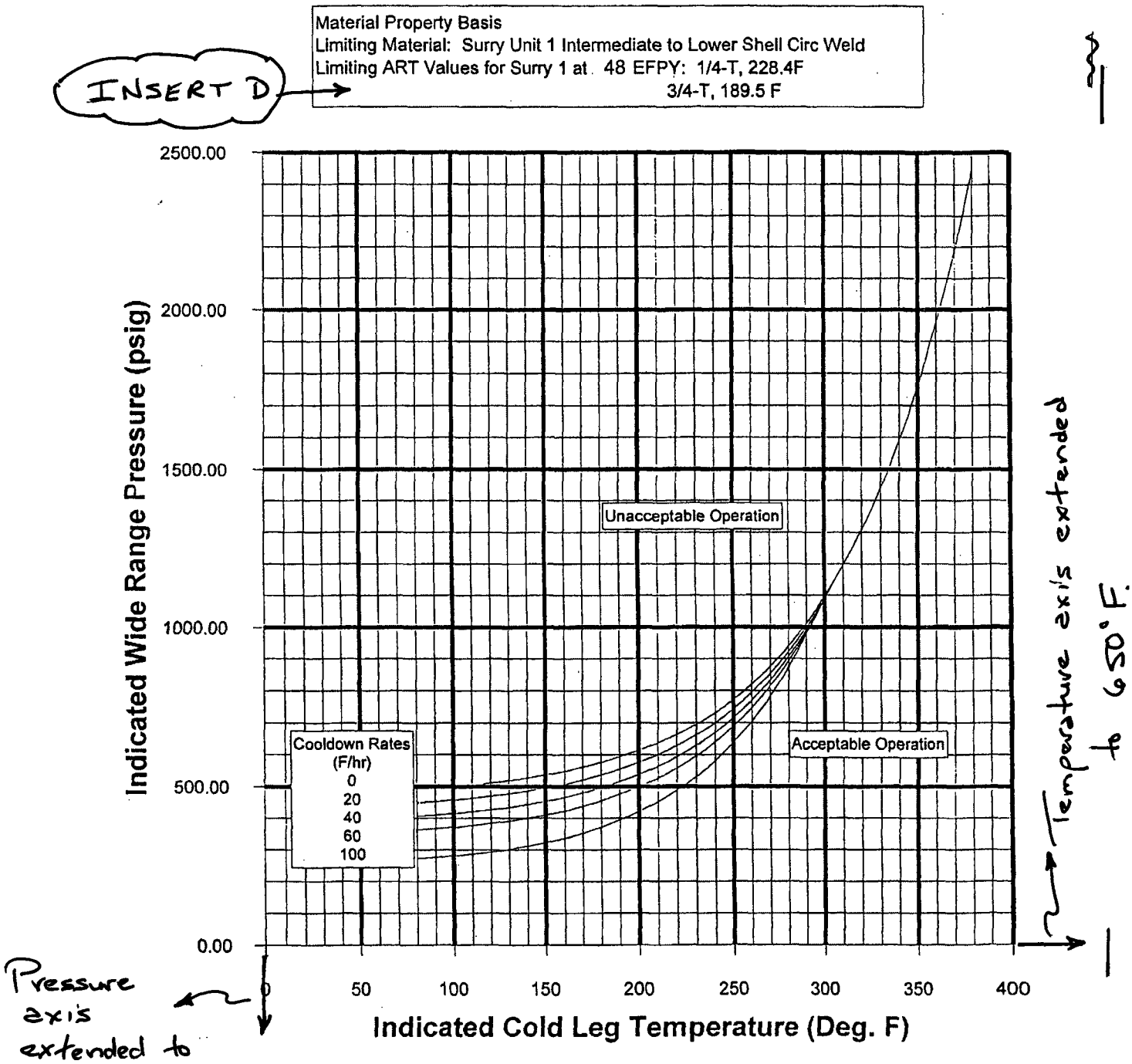


Figure 3.1-2 : Surry Units 1 and 2 Reactor Coolant System Cooldown Limitations (Cooldown Rates up to 100°F/hr) Applicable for 48 EFPY

INSERT A ON PAGE TS 3.1-7:

c) Vacuum-assist fill of the Reactor Coolant System loops in COLD SHUTDOWN or REFUELING SHUTDOWN is an acceptable condition since the resulting pressure/temperature combination is located in the Acceptable Operation region of Figures 3.1-1 and 3.1-2.

INSERT B ON PAGE TS 3.1-9:

The heatup and cooldown limit curves were previously calculated using the most limiting value of RT_{NDT} (228.4°F) which occurred at the 1/4-T, 0° azimuthal location in the Unit 1 intermediate-to-lower shell circumferential weld. Subsequently, the reactor vessel material property basis was amended based upon new data which showed that the most limiting value of RT_{NDT} (222.5°F) at 48 EFPY occurs at the 1/4-T, 0° azimuthal location in the Unit 2 intermediate-to-lower shell circumferential weld. The revised limiting material property (i.e., Unit 2 RT_{NDT} of 222.5°F) justified continued use of the existing heatup and cooldown limit curves (based on the Unit 1 RT_{NDT} of 228.4°F) to 48 EFPY for Units 1 and 2.

INSERT C ON PAGE TS 3.1-12:

The reactor boltup temperature is defined in 10 CFR 50, Appendix G as "The highest reference temperature of the material in the closure flange region that is highly stressed by the bolt preload." The reactor vessel may be bolted up at a temperature greater than the initial RT_{NDT} of the material stressed by the boltup (e.g., the vessel flange). As noted on Figures 3.1-1 and 3.1-2, the limiting boltup temperature is 10°F. An administrative minimum boltup temperature limit greater than 10°F is imposed in station procedures to ensure the Reactor Coolant System temperatures are sufficiently high to prevent damage to the reactor vessel closure head/vessel flange during the removal or installation of reactor vessel head bolts. The limiting boltup temperature and the administrative minimum boltup temperature limit are in effect when the reactor vessel head bolts are under tension.

INSERT D ON FIGURES 3.1-1 AND 3.1-2:

Limiting Boltup Temperature Surry Unit 1 Initial RT_{NDT} Closure Flange Region: 10°F

Attachment 3

PROPOSED TECHNICAL SPECIFICATIONS AND BASES PAGES

Virginia Electric and Power Company
(Dominion)
Surry Station Units 1 and 2

3. The pressurizer heatup and cooldown rates shall not exceed 100°F/hr. and 200°F/hr., respectively. The spray shall not be used if the temperature difference between the pressurizer and the spray fluid is greater than 320°F.

Basis

The temperature and pressure changes during heatup and cooldown are limited to be consistent with the requirements given in the ASME Boiler and Pressure Vessel Code, Section III, Appendix G.

1) The reactor coolant temperature and pressure and system heatup and cooldown rates (with the exception of the pressurizer) shall be limited in accordance with Figures 3.1-1 and 3.1-2.

   a) Allowable combinations of pressure and temperature for specific temperature change rates are below and to the right of the limit lines shown. Limit lines for cooldown rates between those presented may be obtained by interpolation.

   b) Figures 3.1-1 and 3.1-2 define limits to assure prevention of non-ductile failure only. For normal operation, other inherent plant characteristics, e.g., pump heat addition and pressurizer heater capacity, may limit the heatup and cooldown rates that can be achieved over certain pressure-temperature ranges.

   c) Vacuum-assist fill of the Reactor Coolant System loops in COLD SHUTDOWN or REFUELING SHUTDOWN is an acceptable condition since the resulting pressure/temperature combination is located in the Acceptable Operation region of Figures 3.1-1 and 3.1-2.

2) These limit lines shall be calculated periodically using methods provided below.

3) The secondary side of the steam generator must not be pressurized above 200 psig if the temperature of the steam generator is below 70°F.

Heatup and cooldown limit curves are calculated using the most limiting value of the nil-ductility reference temperature, RT_{NDT}, at the end of 48 Effective Full Power Years (EFPY) for Units 1 and 2. The heatup and cooldown limit curves were previously calculated using the most limiting value of RT_{NDT} (228.4°F) which occurred at the 1/4-T, 0° azimuthal location in the Unit 1 intermediate-to-lower shell circumferential weld. Subsequently, the reactor vessel material property basis was amended based upon new data which showed that the most limiting value of RT_{NDT} (222.5°F) at 48 EFPY occurs at the 1/4-T, 0° azimuthal location in the Unit 2 intermediate-to-lower shell circumferential weld. The revised limiting material property (i.e., Unit 2 RT_{NDT} of 222.5°F) justified continued use of the existing heatup and cooldown limit curves (based on the Unit 1 RT_{NDT} of 228.4°F) to 48 EFPY for Units 1 and 2. The limiting RT_{NDT} at the 1/4-T location in the core region is greater than the RT_{NDT} of the limiting unirradiated material. This ensures that all components in the Reactor Coolant System will be operated conservatively in accordance with applicable Code requirements.

The reactor vessel materials have been tested to determine their initial RT_{NDT}; the results are presented in UFSAR Section 4.1. Reactor operation and resultant fast neutron (E greater than 1 MEV) irradiation can cause an increase in the RT_{NDT}. Therefore, an adjusted reference temperature, based upon the copper and nickel content of the material and the fluence was calculated in accordance with the recommendations of Regulatory Guide 1.99, Revision 2 "Effects of Residual Elements on Predicted Radiation Damage to Reactor Vessel Materials." The heatup and cooldown limit curves of Figures 3.1-1 and 3.1-2 include predicted adjustments for this shift in RT_{NDT} at the end of 48 EFPY for Units 1 and 2 (as well as adjustments for location of the pressure sensing instrument).

Surveillance capsules will be removed in accordance with the requirements of ASTM E185-82 and 10 CFR 50, Appendix H. The surveillance specimen withdrawal schedule is shown in the UFSAR. The heatup and cooldown curves must be recalculated when the ΔRT_{NDT} determined from the surveillance capsule exceeds the calculated ΔRT_{NDT} for the equivalent capsule radiation exposure, or when the service period exceeds 48 EFPY for Units 1 and 2 prior to a scheduled refueling outage.

The reactor boltup temperature is defined in 10 CFR 50, Appendix G as "The highest reference temperature of the material in the closure flange region that is highly stressed by the bolt preload." The reactor vessel may be bolted up at a temperature greater than the initial RT_{NDT} of the material stressed by the boltup (e.g., the vessel flange). As noted on Figures 3.1-1 and 3.1-2, the limiting boltup temperature is 10°F. An administrative minimum boltup temperature limit greater than 10°F is imposed in station procedures to ensure the Reactor Coolant System temperatures are sufficiently high to prevent damage to the reactor vessel closure head/vessel flange during the removal or installation of reactor vessel head bolts. The limiting boltup temperature and the administrative minimum boltup temperature limit are in effect when the reactor vessel head bolts are under tension.

References

(1) UFSAR, Section 4.1, Design Bases

Surry Units 1 and 2
Reactor Coolant System Heatup Limitations

Material Property Basis
Limiting Material: Surry Unit 1 Intermediate to Lower Shell Circ Weld
Limiting ART Values for Surry 1 at 48 EFPY: 1/4-T, 228.4°F
3/4-T, 189.5°F
Limiting Boltup Temperature Surry 1 Initial RT_{NDT} Closure Flange Region: 10°F

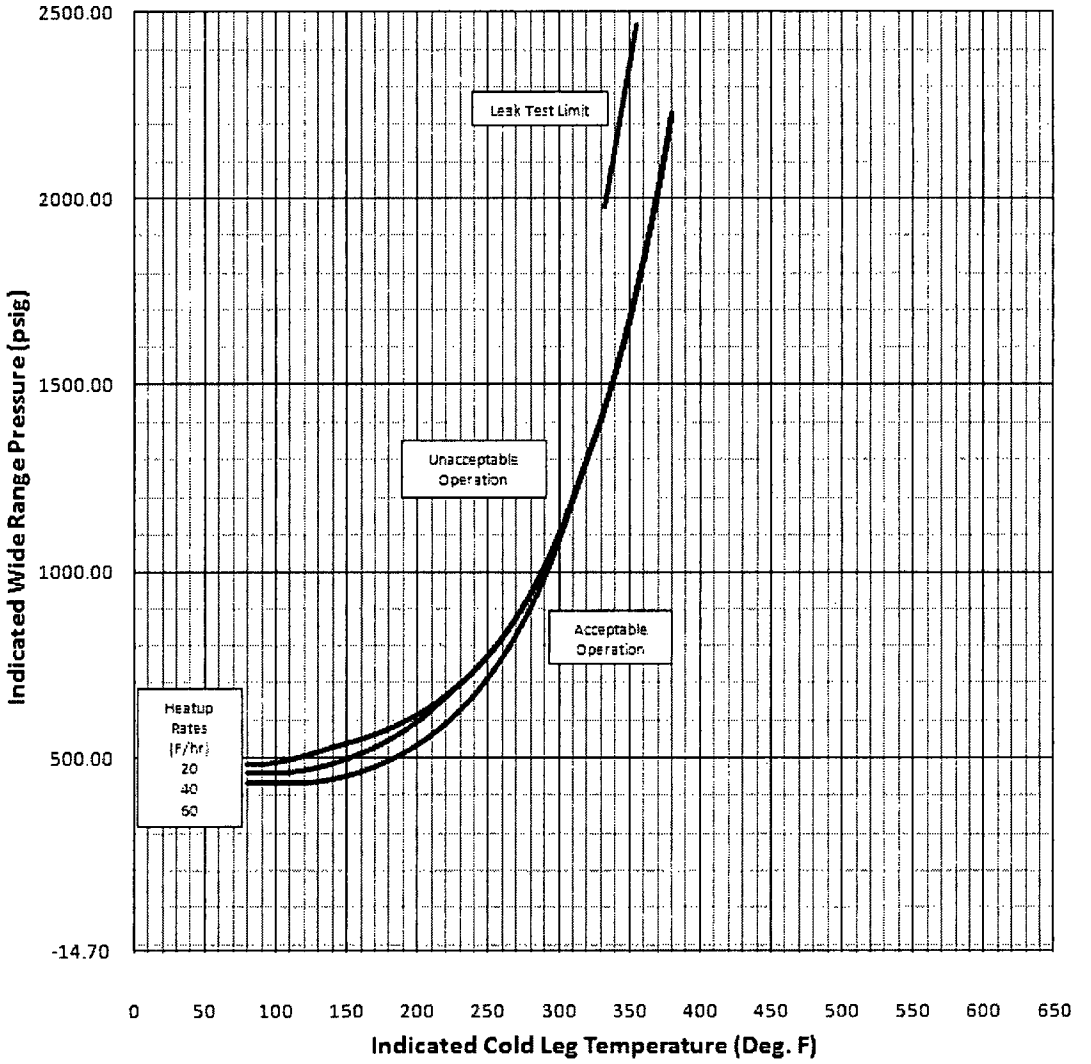


Figure 3.1-1 : Surry Units 1 and 2 Reactor Coolant System Heatup Limitations (Heatup Rates up to 60°F/hr) Applicable for 48 EFPY

Surry Units 1 and 2
Reactor Coolant System Cooldown Limitations

Material Property Basis
Limiting Material: Surry Unit 1 Intermediate to Lower Shell Circ Weld
Limiting ART Values for Surry 1 at 48 EFPY: 1/4-T, 228.4°F
3/4-T, 189.5°F
Limiting Boltup Temperature Surry 1 Initial RT_{NDT} Closure Flange Region: 10°F

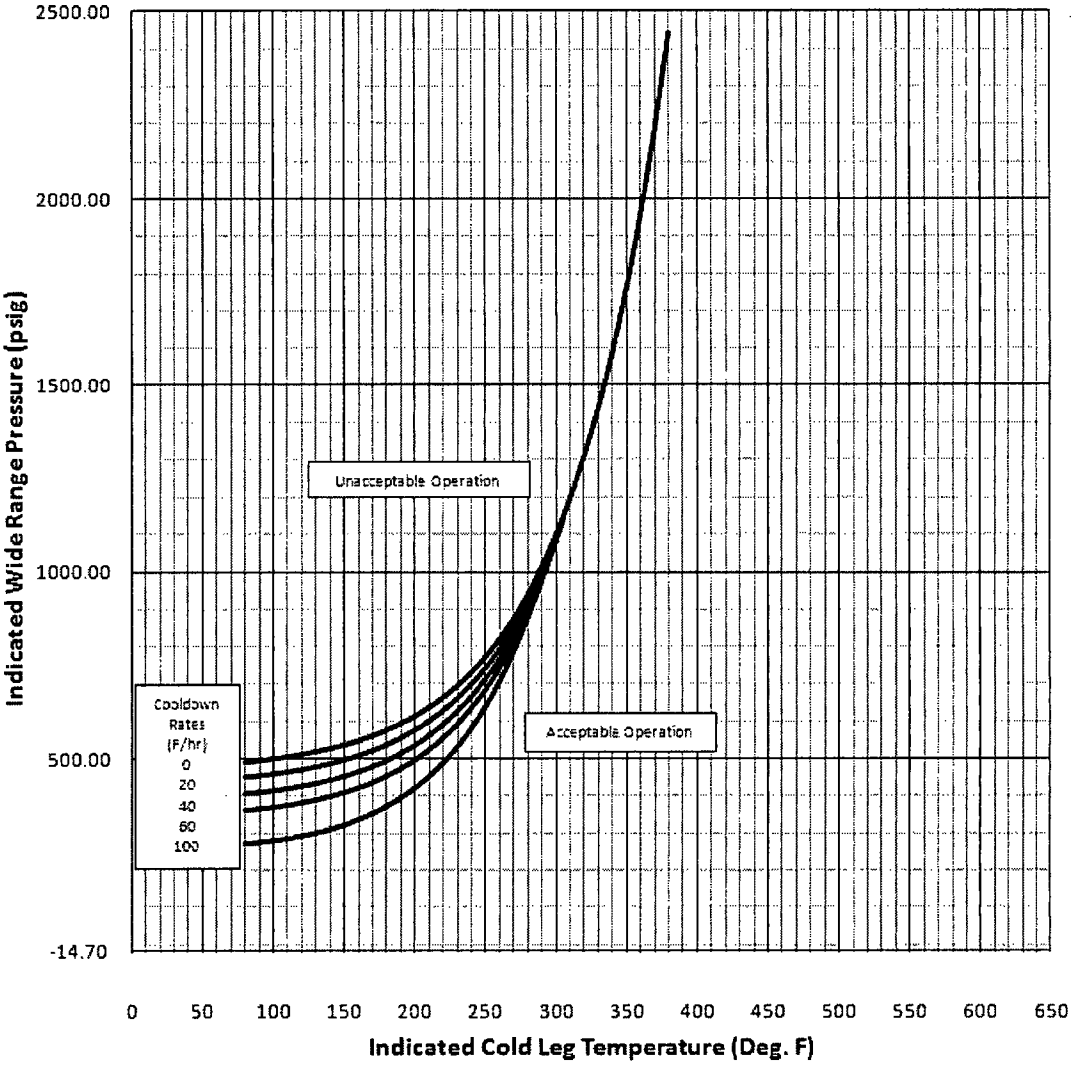


Figure 3.1-2 : Surry Units 1 and 2 Reactor Coolant System Cooldown Limitations (Cooldown Rates up to 100°F/hr) Applicable for 48 EFPY